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Report on Project No. 7955-16

ALASKAN AIR COMMAND

ARCTIC AEROMEDICAL LABORATORY

LADD AIR FORCE BASE

TECHNICAL NOTE

⑬ AAL-TN-57-5

⑭ CONTINUATION OF FACTORS AFFECTING WATER PURIFICATION,

⑮ by Lester Baribo

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## CONTINUATION OF FACTORS AFFECTING WATER PURIFICATION

Lester Baribo

### INTRODUCTION

The following is a continuation of the work reported in Technical Note AAL-TN-56-13. The methods used were the same as those used in the above note. The work has been extended to determine the effect of pH on the disinfecting action of chlorine, iodine, and colloidal silver. The effects of various other factors affecting the action of colloidal silver are also reported.

### RESULTS

The effects of pH on the action of various chemicals tested<sup>\*</sup> are shown in Figures 1, 2, and 3. ~~The distilled water was buffered with 0.005 M phosphate buffer.~~ Lowering the pH enhanced the action of chlorine and iodine. The result with colloidal silver indicated no effect of pH. ~~It perhaps is more accurate to say that the effect is small, as the next~~ higher concentration test ~~(10<sup>-3</sup>)~~ showed complete inhibition of the organisms.

~~Figure 4 shows~~ the effect of temperature on the action of colloidal silver. As the temperature increased from 0°C. to 37°C. there was a marked increase in the inhibitory properties of colloidal silver.

\* with resp. to resp. in test

Figure 5 shows the effect of  $\text{Ca}^{++}$  ions on colloidal silver. Increasing the  $\text{Ca}^{++}$  ion concentration inhibited the action of the colloidal silver. Similar effect was produced with iodine.

Figure 6 shows the effect of  $\text{Fe}^{+++}$  ions on colloidal silver. A similar action occurred to that of Ca with inhibition at high concentration.

Figure 7 shows the effect of organic matter. The data indicate that organic matter had no effect on the action of colloidal silver.

#### DISCUSSION

These data indicate that colloidal silver would be unsatisfactory as a purificant for water in the field. The relatively long time required to be effective would be sufficient reason to discard it. It is also affected by other physical and chemical factors which affect chlorine and iodine. Tests were carried out in the laboratory to determine the physiological reaction of white mice fed colloidal silver. Ten mice were fed all their water as  $10^1$ ,  $10^2$ ,  $10^3$ , and  $10^4$  dilution of colloidal silver for 3 months. No abnormal pathology was noted. Mice drinking the highest concentrations became dehydrated and failed to grow rapidly; however, no other adverse effects were observed.

Samples of water were collected on various field trips at Galena and Arctic Village to determine physical and chemical properties. Analyses made were found in the same range as that reported in the literature.

The result of this study indicates that none of the chemicals tested is ideal as a water purificant. The results do not indicate any combination which would be effective. Further studies are needed.

FIG. 1 EFFECT OF pH ON DESTRUCTION OF *E. COLI* AT  
0°C BY CHLORINE

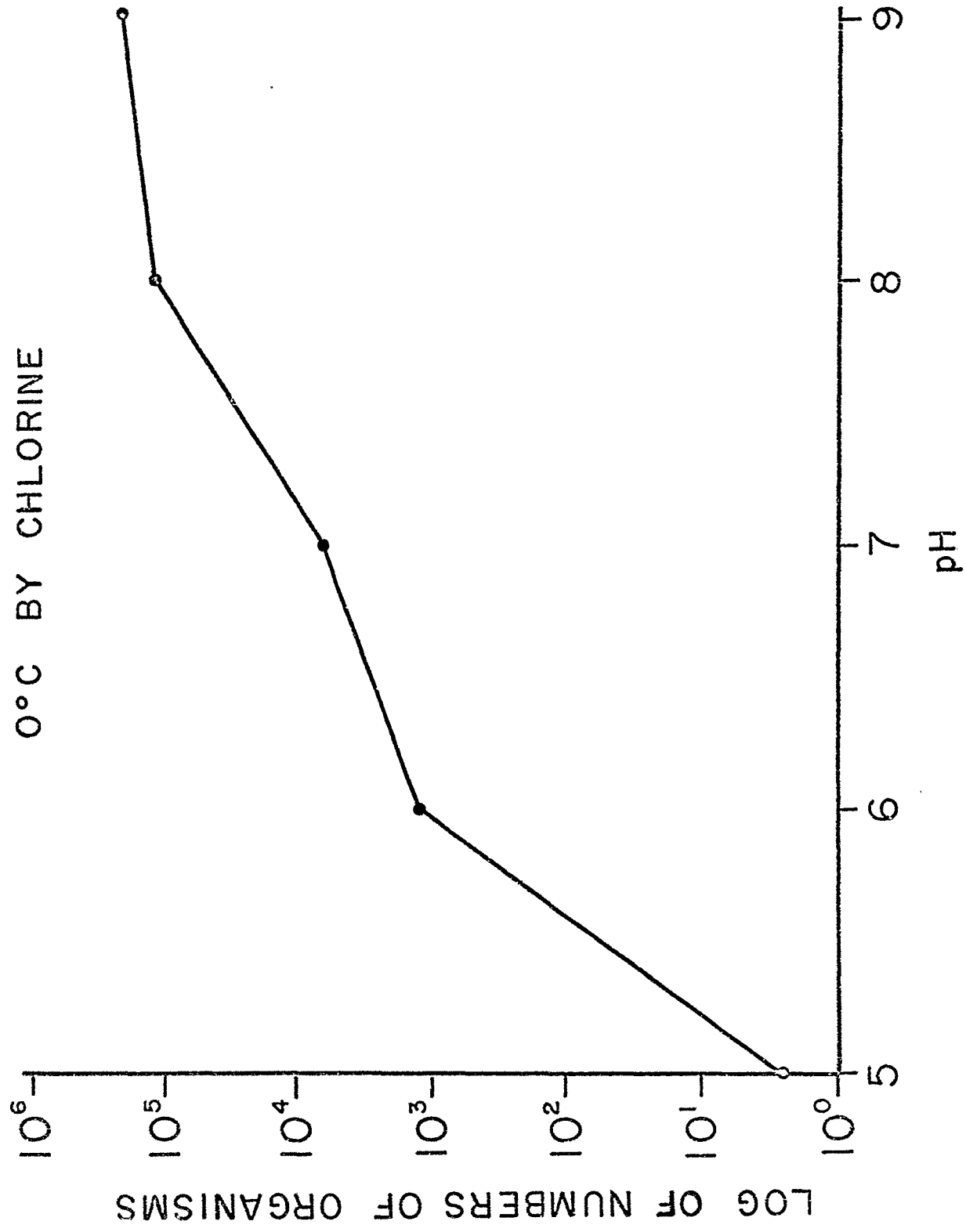


Fig. 2 EFFECT OF pH ON DESTRUCTION OF E. COLI AT 0°C.

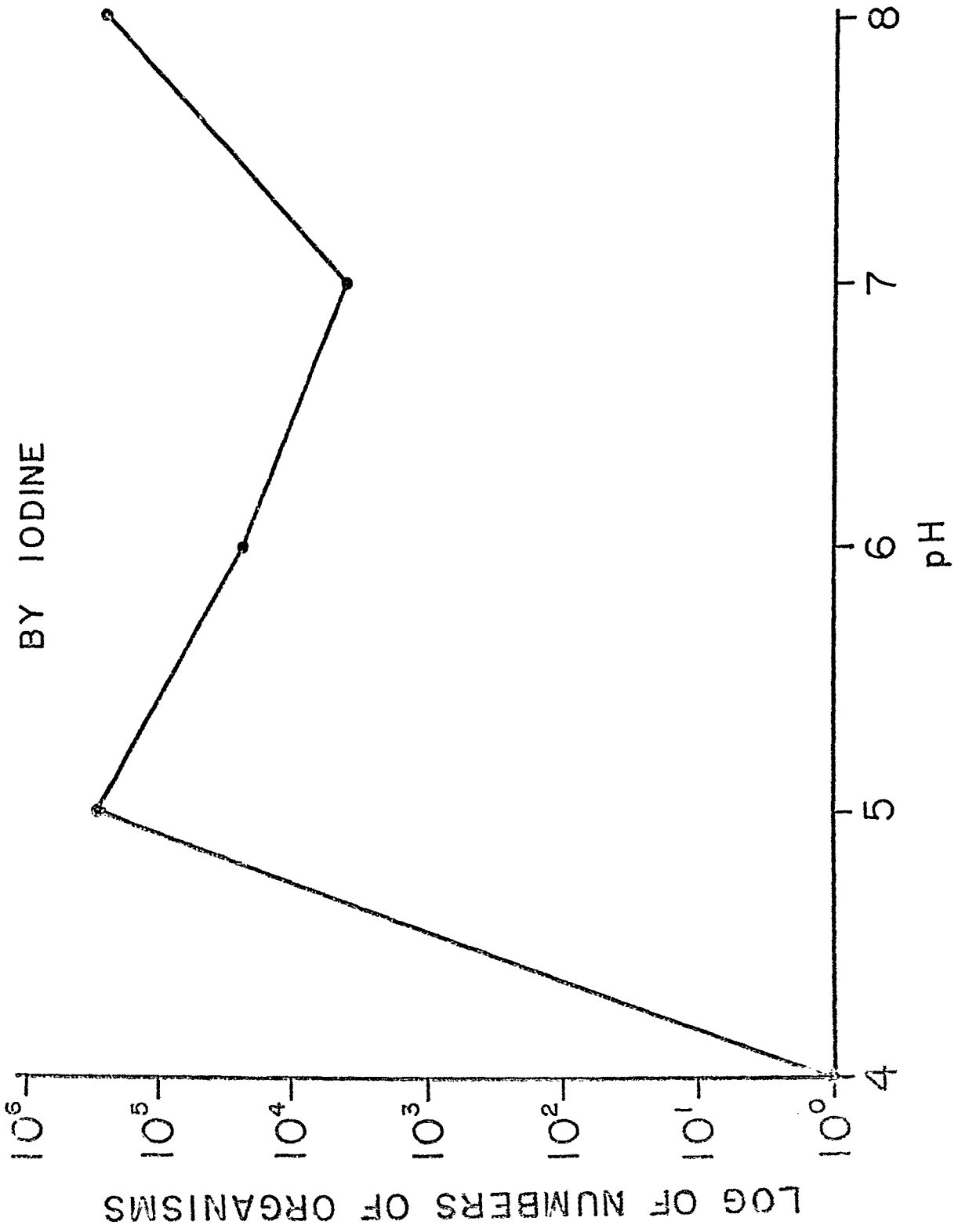


FIG. 3 EFFECT OF pH ON DESTRUCTION OF *E. COLI*  
AT 0° C BY COLLOIDAL SILVER

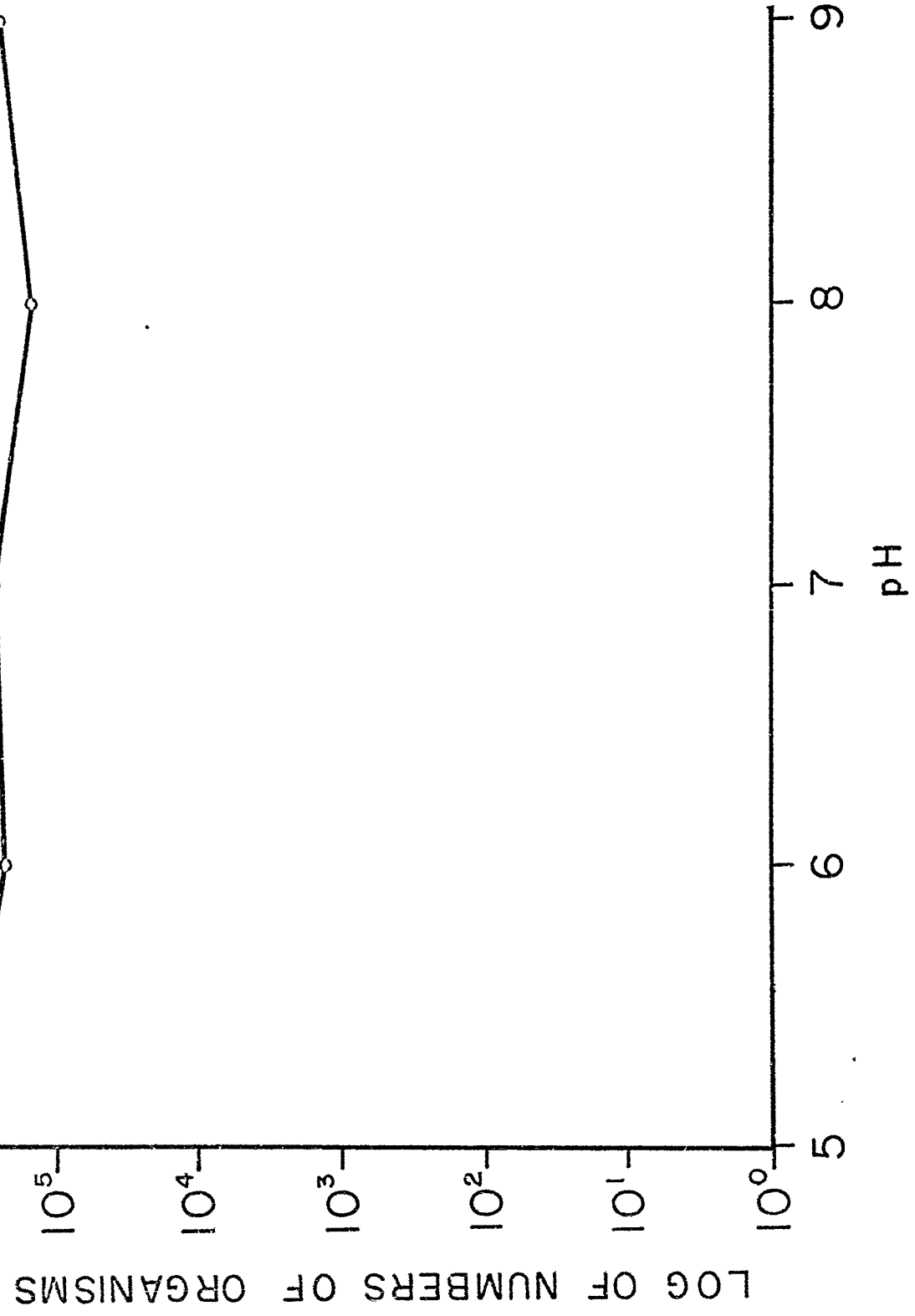




Fig. 2. EFFECT OF TEMPERATURE ON DESTRUCTION OF  
E. COLI BY COLLOIDAL SILVER

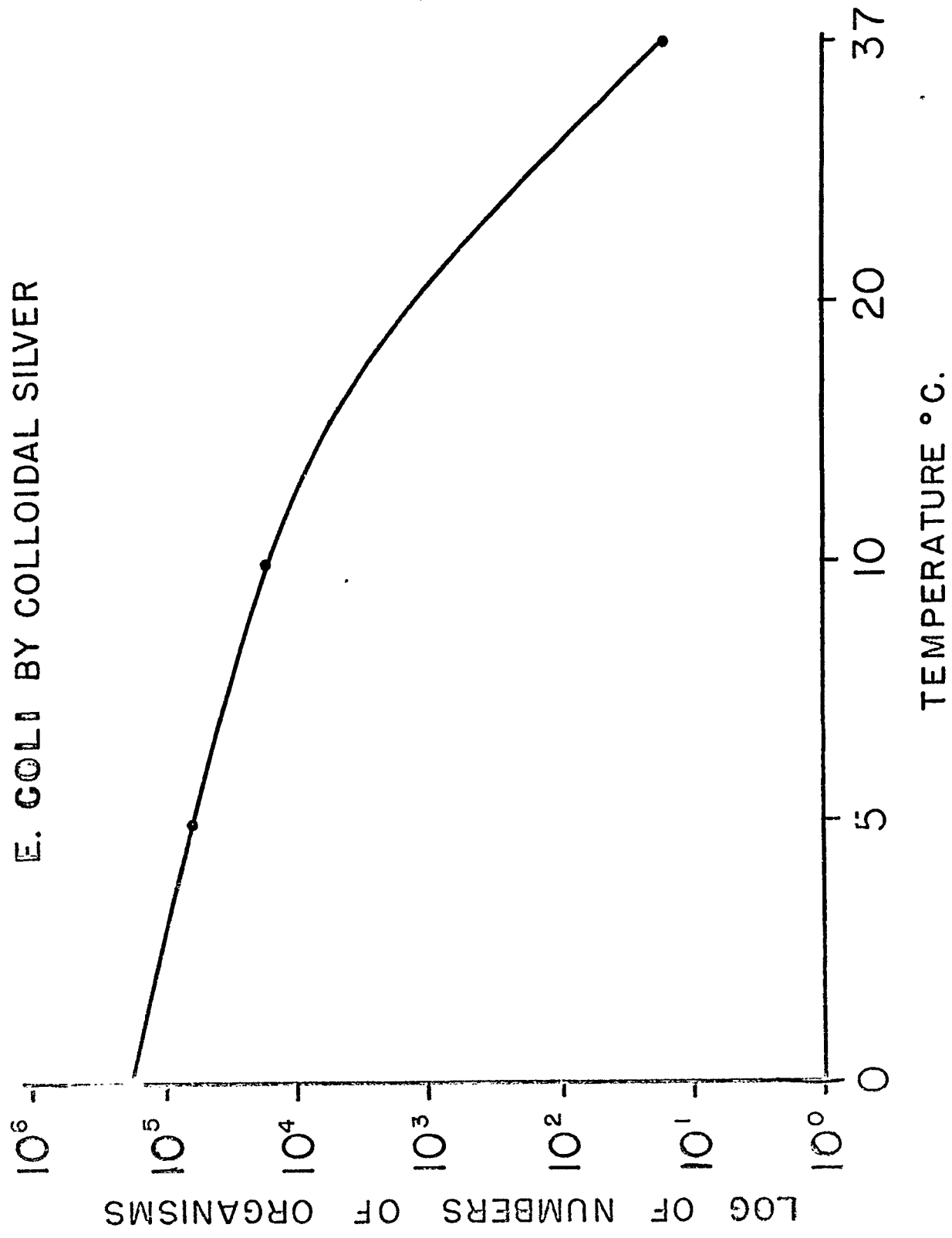


Fig. 5 EFFECT OF  $Ca^{++}$  IN PRESENCE OF COLLOIDAL SILVER  
ON DESTRUCTION OF E. COLI AT 0° C.

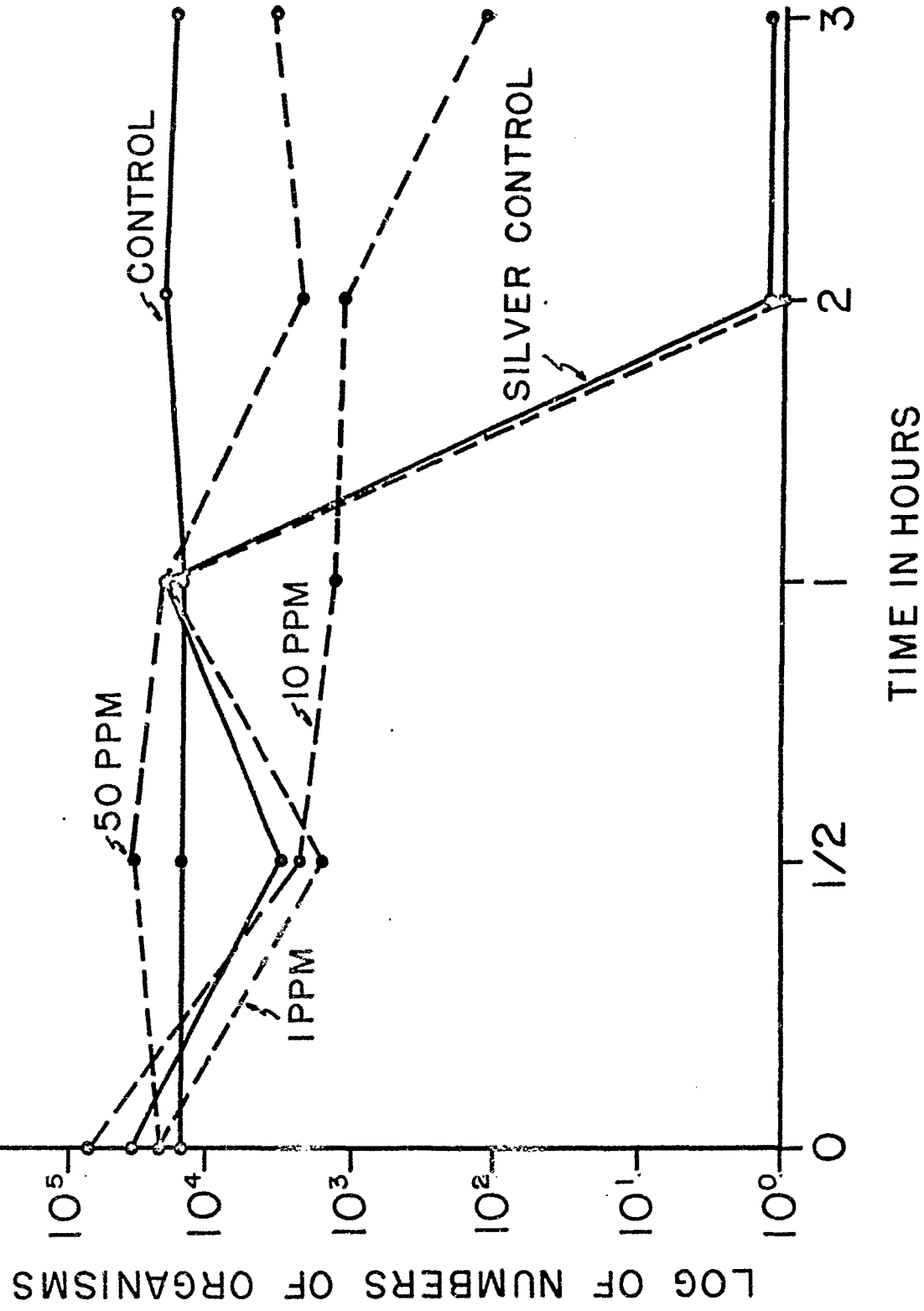
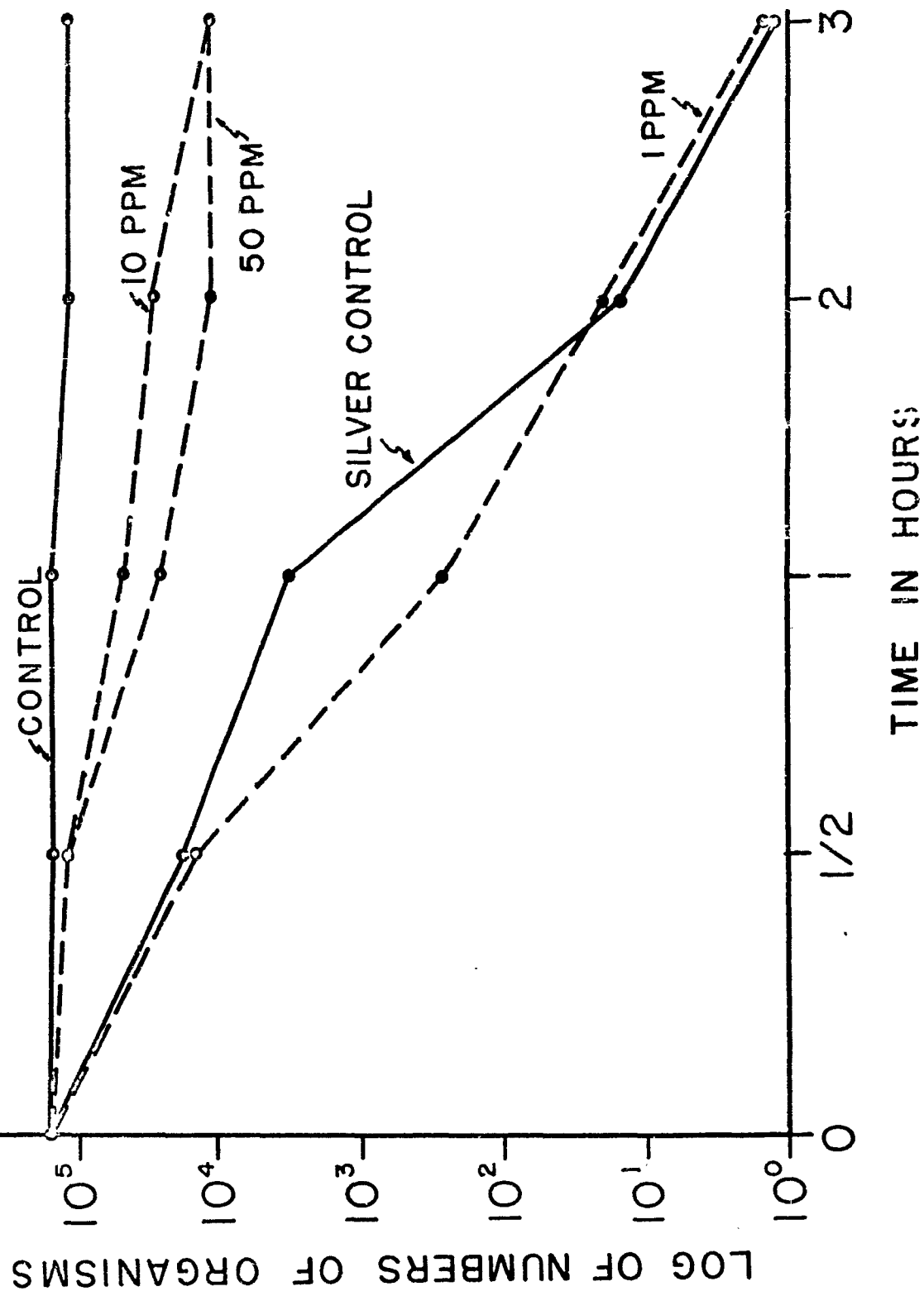


Fig. 6 EFFECT OF  $\text{Fe}^{+++}$  IN PRESENCE OF COLLOIDAL SILVER ON  
DESTRUCTION OF E. COLI AT 0° C.



40.7 EFFECT OF ORGANIC MATTER IN PRESENCE OF COLLOIDAL  
SILVER ON DESTRUCTION OF E. COLI AT 0° C.

